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Galvano-puncture applied to the treatment

GALVANO-PUNCTURE

APPLIED TO THE TREATMENT OF

ANEURISMS.

A GRADUATING THESIS BY

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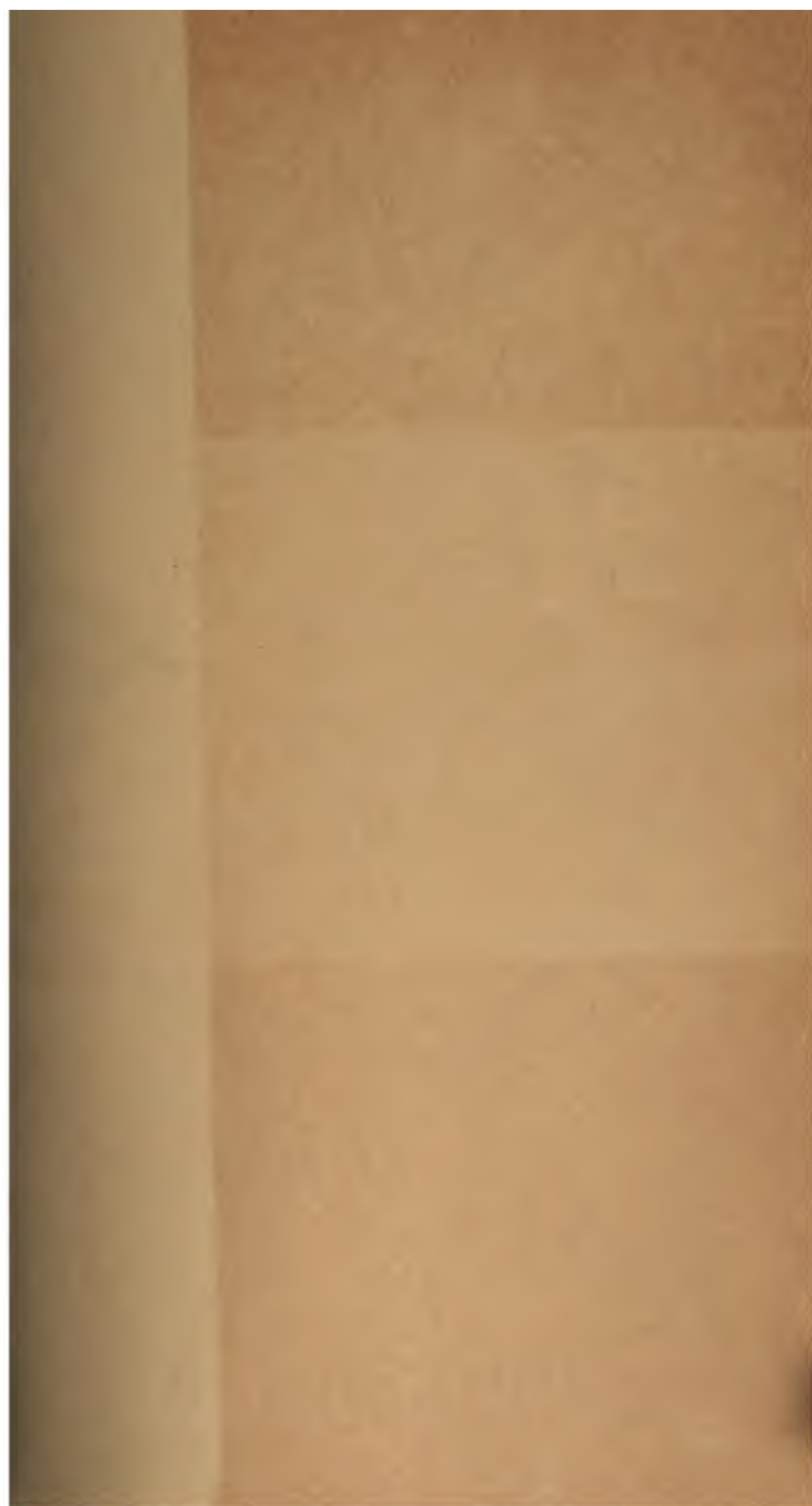
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GALVANO-PUNCTURE.

Of all the forces that the Surgeon is accustomed to bring to his aid, none is more useful than electricity ; an element which is rapidly becoming an indispensable assistant at the operating table, though its value has never been fully appreciated, and 'till late, it has been chiefly associated with empiricism and quackery, and not regarded as it should be, as an extremely valuable agent, in which rests much relief for afflicted humanity. The many varieties of its application would be too prolific a subject to treat of in the small compass of a graduating thesis, so I propose to deal with the last of the two divisions of Electrolysis (medical and surgical,) and choose for the subject of my remarks, a subdivision of surgical electrolysis, viz : Galvano-puncture.

This method of treatment has a number of valuable applications, but none of them are of more importance, than its successful use in the cure of Aneurism.

In the surgical management of these cases, it has been the aim of the operator to produce a coagulation of the blood in the interior of the arterial tumor, thus filling it up, and checking any further growth.

Numerous means have been adopted to accomplish this, and for simplicity, I will class them under two heads. viz :—

1. Stoppage of the supply of blood to the aneurism,
2. Direct coagulation of the contents of the sac.

The first may be still subdivided into

1. Ligation.
2. Digital or Mechanical pressure over the artery.
3. Acupressure.

The second into

1. Pressure over the Sac.
2. Acupuncture.
3. Injection of Styptics..
4. Introduction of foreign substances, &c.

But often these measures are dangerous, inexpedient, or impracticable, we then confidently turn to Galvano puncture.

The discovery of this important branch of surgical treatment, as near as I can ascertain, originated in the fertile brain of M. Pravaz of Milan, in the year 1832, but his results were so unfavorable that it was almost entirely neglected till 1838, when Liston turned the attention of the profession to its success in his hands, with several cases that came under his observation; but either failing to engage the interest of the surgeons of the day, or losing its success, it fell into disuse till 1845, when M. Petrequin of Paris, presented it again to the surgical world.

His experiments were brilliant and conclusive, and now it seemed as if it might be considered a new resource in aneurismal surgery. M. Abiella in the same year performed several most satisfactory experiments on animals before the Scientific Society of Milan.

Ex 1. Oxygen passed through albumen at a temperature of 98—100 ° F. deposits a substance resembling fibrine; when the albumen is slightly acidulated, and when the process goes on in contact with a serous membrane, the action is more energetic.

Ex 2. Hydrogen, passed through the same fluid in a like manner, produced a jelly-like looking substance, called by Smee, "artificial chondrin."

(When these gases (H. O.,) are generated in the fluid acted upon, the action is more marked.)

Ex 3. When the poles of a galvanic battery are passed into a bladder containing albumen, a marked coagulation takes place about the positive pole, while at the negative a flaky, curdy and flocculent mass is collected.

* Baumgarten introduced the two needles into a vessel filled with albumen, and holding litmus paper, successively to each, obtained an acid reaction at the positive pole, and an alkaline at the negative, where the reddened paper was restored to its original color.

* "*Zitschift du gisitschaft du ditze zu wein.*"

Combining the results of these experiments, we find that by placing our needles in a cavity containing fluid blood, the acid formed at the positive pole will coagulate the fibrin in its vicinity, generating oxygen, and forming more acid with some element of the blood, as the galvanic action is kept up by the battery. Thus must it be in the aneurismal cavity; the fibrin is separated from the blood, and collected about the needles as material for new tissue.

After a short period, if a portion of this clot be microscopically examined it will be found that organization has commenced, that the protoplasmatic cells may be seen in their different forms and stages of development, the elongation of some, the more advanced union of others, to form a new blastemal tissue. I beg to call your attention to the photograph that accompanies this Thesis; it was made by a combination of the microscope and camera, and after several unsuccessful attempts, I was enabled to obtain the appearance of the tissue described above.

This fibrinous structure is deposited on the sides of the sac, in laminations which can be readily stripped from one another when it occurs in the interior of the aneurism.

This lamination is found throughout the sac after several applications of the Galvano-puncture, and when cut in two the mass gives the observer the familiar appearance of the arrangement of the layers of an onion.

When the aneurismal cavity is entirely filled, the lowly organized structure, instead of taking on vascularity, is gradually absorbed, as is the rule with the majority of false membranes and tissues found in other parts of the body.

Having considered the pathology of the process, I will now call your attention to the preliminary steps of the operation.

For some weeks before the operation, the patient should be put upon as nearly an animal diet as is consistent with health, with the idea of increasing the plastic elements of the blood. For several days previous to the first operation he should be given small repeated doses of Digitalis, Aconite, or some other moderator of the heart's action, and during the operation itself, a large room, with plenty of fresh air, is highly conducive to success.

The patient should be laid on a low bed, perfectly level. that the circulation may be equable and unconstrained, the surface should be kept warm, and the surroundings be such, that the patient's mind may not be excited by any of the preparations.

On either side, (usually that nearest the part to be operated upon,) a small table is to be placed, on which the battery: hereafter to be described, is laid. An assistant watches the pulse, while another administers the anaesthetic, (Ether being the most desirable.)

When the patient is fully anaesthetised, which is necessary, for the pain is intense, the operator taking the positive needle, which is gilded and coated with some insulating substance, and the negative, a metal plate, covered with sponge, inserts the former to such a depth, that several lines uninsulated penetrate the cavity, and holds the latter, the sponge having been moistened at a point as nearly opposite the insertion of the positive as possible.

The battery, which should at least consist of 15 of Bunsen's small cups, is let gradually on, using but few cups at first, and increasing gradually as the operation goes on. The assistant at the pulse now will feel a great irregularity in its action, increasing at first, generally, next decreasing, and remaining so.

The tumor will become red, oedematous about the entrance of the needle, (positive,) and greatly distended, by the rapid formation of gas in the interior; at the same time, there will be a rapid increase in the temperature, and if this continues in violence, we may safely judge that a secondary inflammation will follow. The point of application of the negative sponge will be vesicated and excoriated.

After withdrawing the needles at the expiration of such a time, as the judgment of the surgeon shall suggest, the finger should be placed over the point of entrance; should hemorrhage occur, the Liq. Ferri Persulph will quickly staunch the slight flow, but if all is well, the opening may be closed by a small piece of adhesive plaster.

In removing the needle the operator often finds difficulty,

for large masses of clot may render its withdrawal no easy matter, a steady, careful traction will effectually accomplish the matter, however.

The needle is always corroded by the excess of acid generated, and often it is found to be reduced to a mere hair.

The time during which the needles are allowed to remain in the cavity, depends greatly on the size of the tumor, and the force of the current. Cases have been known, in which 20 minutes sufficed to completely solidify the growth and stop all pulsation; if a moderate seance of from 15 to 30 minutes is not sufficient, a repetition of the operation may be performed, Niccoli made as many as six operations in a week, though it is best to allow longer intervals to elapse, that the inflammation may not be too violent.

It is advisable to press the distal ends of the artery or arteries, which the aneurism involves; by this precaution, the coagulation is rendered easier, and the possibility of the detachment of small pieces of the clot that might form emboli is prevented.

I deem it important to again refer to the pain which invariably accompanies the operation, and the necessity for an anæsthetic. The Italian surgeons unanimously affirm that the pain is intense, and Phillips states that in several of his cases, the patients fainted from sheer physical exhaustion.

During the operation a "moist rale" will be audible; this is caused by the rapid evolution of small bubbles of gas rising to the surface and breaking; they are chiefly hydrogen gas, and are liberated from the negative pole.

Coagulation not occurring in such a degree as to fill up the aneurism completely, a mechanical deposit of fibrin effects the final solidification. If this does not follow, a mild inflammatory process, from the heat generated during the operation, fills the sac by its products.

The success of the operation depends on the following conditions, viz:

1. The size of the aneurism.
2. A proper insulation.
3. The exact amount of galvanic force.

1. In large aneurisms, with thin walls, and violent pulsation, the success of the operation is not evident, not only is the production of a galvanic clot a difficult matter, but so great is the force of the circulating current that the process is highly impracticable.

2. A proper covering of the needle by some non-conductor, is of the utmost importance. If this is not carefully attended to, the heat produced by a large exposed non-conducting surface will give rise to a violent secondary inflammation, so severe that the entire sac may subsequently slough away—a most unhappy occurrence.

Another deplorable danger, and one that has seriously affected the success of the earliest operators, is the sloughing of the track of the non-insulated needle. When in such cases, the slough separates, it will come away in the form of a cone, the base above; the diffusion of the current in this shape is supposed to account for it. The consequences, secondary hemorrhage, can be fully realized.

To prevent these dangers, the needle has been insulated by various substances, with indifferent success. Petrequin recommends wax, Brocca, shellac, Phillips, black enamel, &c &c.

I beg leave to present a formula with which I coated the needles successfully used in a case to be presently alluded to. None of the destruction of tissue followed, and but a slight black spot, with a few enlarged surrounding capillaries marked the entrance.

R Gum Shellac, (Brown.).....1 drachm.
Sol. India Rubber, (Squibbs.).....1½ drachms.
Chloroformae,2 drachms.

3. The force and power of the galvanic battery should be carefully regulated. Too great an action may form a very curdy, loose clot, easily broken up by the circulating blood, and carried off as emboli.

This production of emboli, *Morgan denies, and insists that when existing, they are but small fragments, torn from the sloughing membrane, that always is found after the operation in some amount. The rapid evolution of gas may seem dan-

* Electric Physiology and Therapeutics.

gerous, when the action is exceeding violent, but * Nysten found that from 40 to 100 per cent of air had to be suddenly introduced into the jugular vein to produce death—much more than is possible here.

Too weak a current will prevent the formation of clots.

The dangers of the operation have indeed been magnified, and assuredly upon slight foundation. In the crude workings of the earlier experimenters on the subject, a general want of proper knowledge and apparatus has defeated success. It must be evident to all that proper manipulation and care will assist the intelligent surgeon to make the procedure a safe and valuable one. The discoveries of the Italians were characterized by the peculiar implements with which they worked; perhaps the most striking example was the galvanic pile of Volta. This apparatus was even used by Petrequin and Brocca a quarter of a century ago.

The battery with which Petrequin was successful was composed of some sixty plates of copper and zinc piled one on another alternately and separated by small squares of cloth dipped in a solution of some of the weaker acids; to the extreme plates were fastened the negative and positive wires.

The current should be the "continuous" and not the "uninterrupted," or "induction."

For the generation of the current, we may then choose either of the simple batteries in vogue—though Bunsen has the preference. Grove is very strong, though the acid fumes which emanate are decidedly disadvantageous—while Daniel is so weak proportionately, that a great number of cells must be used—this involves a cumbrous apparatus.

Dr. Guleke, of this city, has been in the habit of using a very compact arrangement of 18 Bunsen elements. I believe he has a smaller one for transportation, combining the same power.

In regard to the use of needles there has been much discussion.

Petrequin insists on the employment of two needles, that must be crossed at their points. Sir W. Hamilton used two, as did Pravaz. Revenus advocated 4-6 to be inserted 8-10 Milli-

* Bouillard L'Introduction de l'air dans les veins.

metres apart*. It cannot be denied that the greater the number of insertions the more the danger must be increased. The poor conductive power of the negative pole should always be taken into account, consequently the heat at this point is intense.

Baumgarten, taking this into consideration, devised the method of using but *one* needle. His result was based on experiments made with a bladder. He applied the negative pole to the exterior of the sac, and inserted the positive pole. Since then the single needle has been employed, while before the violent secondary inflammation often thwarted any approach to success, and baffled the sanguine endeavors of those who eventually failed.

Another very considerable obstruction was removed by this improvement, viz: the evolvment in quantities of hydrogen gas at the negative pole, which often dissolved the clot as soon as it was formed.

In the selection of needles it should be the aim of the galvanist to procure a needle that would be the best conductor. It is obvious therefore, that a large needle is better than a smaller one, a good conducting medium, more to be desired than an obstructing one, the resistance of the current and generation of heat being annoyances to be overcome as completely as possible.

As materials for the composition of needles—zinc, platinum, silver and gold—have in their turns been lauded, but steel is now universally conceded to be the best—the others rapidly corroding at their points, and being oftentimes extracted with extreme difficulty.

Dr. Guleke, of this city, uses a steel needle gilded.

Having considered the most interesting points of the subject, it is well to turn for a moment to its advantages, applicability and success. In the treatment of the many varieties of aneurism, the surgeon is frequently obliged to discard the usual means of relief: the important ligature, pressure, &c., &c., for it is not always that they can be applied; then can the electrified needle of the galvanist be sought for.

The most striking cases, for which usually we can give no

* a little more than the same number of lives.

relief, and cannot do more than tell the sufferer that he must die, are aneurisms of the aorta.

I do not doubt but that it must seem an extraordinarily absurd idea, to suppose that the pulsating mass, that so steadily and inevitably destroys the patient's life, can be controlled by a piece of iron wire of a finger's length, but when we compile the statistics of the past, we cannot but admit that in proportion to the importance and fatality of the disease, the results have been most satisfactory.

Particularly in aneurisms of the greater trunks, especially the Innominate, Subclavian or Iliac, where ligation or other measures may be impracticable or impossible, is this operation indicated, and in these cases we have promise of the greatest success.

Where debility, or other conditions of the system, preclude severer surgical relief, we may also use this process.

As in all other surgical operations, which have been given to the world, we are unable to obtain *exact* reports, either of success or not, and the statistics preserved are neither complete nor definite. Petrequin reports 60 cases, 7 of which died, 23 were cured, 20 were not—though in these 20 that were not cured, it is not probable that most of them were heard from, as all know that patients who do not think that they have been benefitted rarely make their appearance the second time. Petrequin operated successfully on the Subclavian 3 times. *Nicolli operated and removed two cases of aneurism of the aorta. He also operated unsuccessfully on an aneurism of the Facial artery. Up to July, 1851, Boinet had collected 23 cases: 8 of the Brachial, 7 of the Popliteal, 2 of the Subclavian, 1 each of Ophthalmic, Temporal, Ulnar, Carotid, Thoracic Aorta,

Of these 13 failed, 9 succeeded.

Sir W. Hamilton reports a case of aneurism of the Carotid, 1846.

Schuch reports one unsuccessful case of aneurism of the Subclavian,

Dr. Genmirean, of Pisa, one of the Palmar.

* Gaz. Medica di Milan.

Of course it is important to obtain a full list of the cases that have been treated since the compilation of the last writers, and I am obliged to present such as I here give. Total number of cases, 90; cured, 48; not cured, 42.

*Dr. Morgan very justly remarks in regard to the cases not cured, "The number of those not cured is no fair test, owing to many of the reported failures being really where amelioration had been effected, or where the operation was imperfectly performed, or, lastly, where the case was too far advanced to do anything with."

Having fully considered the application of Galvano puncture to the treatment of aneurisms, I beg your attention while I enumerate a few of its other uses.

To begin, we find that it may be advantageously employed as a means of treating malignant growths, vascular tumors, goitres, naevi, circumscribed aneurisms, varicose veins, hydrocele, &c., &c., and as an agent in the abortive treatment of extra uterine foetation.

In malignant growths it seems to exercise a constitutional effect, in suppressing or neutralizing the cancerous diathesis, so says †Dr. Neffle. The cancer cells have their protoplasmic contents so altered as to make the formation of new deposit impossible.

The operation here is performed by two needles, very much as the double needle operation of aneurismal galvano-puncture would be, though the battery that Dr. Neffle uses is that of Siemens, and Kruger and Hirschman.

Dr. Guleke has removed naevi very effectually by the insertion of the needle through the naevus, fastening the positive pole to the free end—this, however, invades the province of Galvano-Causty.

There seems to follow the application of the process a disintegration of the tissues by liberated hydrogen, and a solution of the different alkaline components of the part, with a ligation of the minute capillaries, followed by the death of the structure.

*Electro Physiology and Therapeutics.

†Medical Record, Sept. 1, 1869.

In hydrocele, after the fluid is drawn through the canula, the wires may be passed into the sac and moved about—the inflammation thus produced is much more beneficial and effectual than the same process which follows the use of Iodine.

*Althaus has had the most flattering results in this variety of cases, by inserting *two* needles in the cavity of the tunica vaginalis, their points approximating as nearly as possible, the fluid is absorbed and a low grade of inflammation established, which prevents further effusion.

I would suggest its use in Pelvic Hematocele and in Fungus Haematoides. For the former operation I have devised an instrument, consisting of two parts, a *rectal and vaginal*. The rectal forms the negative electrode, the vaginal a positive. If we are aware of the sudden formation of the collection of blood, we may employ the apparatus.

The positive rod, which is flexible, is to be inserted into the vagina and carried up to a point as near as possible to the centre of the deposit, the rectal or negative part is to be passed through the anus and the sponge placed opposite to the positive. The positive needle, insulated, is forced by a screw lodged in the handle, into the hematocele; the current, moderately strong, is sent from the positive needle to the negative sponge, the period lasting 10–20 minutes, a process is then expected to occur analagous to that which goes on in the aneurismal cavity.

Varices, or the larger convoluted masses of dilated veins, may be solidified in the same way by modifications of the galvano-puncture apparatus.

Cirroid aneurisms, which most often occur on the scalp, elbow and other parts of the body, have in every case operated upon been attended with completely successful results. Liston has operated several times, fully confirming the truth of this statement.

Dr. Boechetti reports a case in *L'Union Medicale*, of the agency of this remarkable power in extra uterine foetation.—He pierced the membranes by two needles and transmitted the

*"Electrolytic treatment of Tumors."

current. The tumor was reduced after a period of two or three days to a much smaller size, and it eventually disappeared.

I earnestly hope that this mode of treatment may take a more prominent place in the field of surgery than it has hitherto; a place which its value assigns it; and to which ere long I trust it will be promoted by the recognition of an appreciative profession.

A. M. H

CASES.

ANEURISM OF THE AORTA.

—N. Y. JOURNAL OF MED., APRIL, '69,

Antonio R., *æt.* 46 years. Sound in constitution, and has undergone no serious illness except an arthritis, complicated with endocarditis. In 1863 he was cured of this affection, and changed his occupation of postillion to that of coachman. In 1866 he began to feel pains, accompanied with pulsation, in the right side of the chest, besides a feeling of lassitude and impediment in the exercise of his occupation as driver.

To these symptoms, which became more and more marked, were added, at the commencement of the past year, dyspnoea and an occasional loss of consciousness. At the same time the pulsations became sensible to the touch through the wall of the chest, which bulged in the form of a tumor at the affected point. Finally the loss of sleep and the impossibility of working or of lying down, induced the patient to enter the Hospital of Cremona, July 24, 1868.

The patient, standing erect, there appeared at the right of the sternum a rounded tumor, elevated from one to one and one-half centimetres above the level of the chest, and extended about six centimetres transversely, somewhat less vertically. This tumor was formed by a curve limited to the third and fourth ribs, and the third intercostal space nearly double in extent. The two ribs presented no other appreciable alteration. Pulsation could be distinctly perceived through them, especially through the third, which was more curved than the others. In the centre of the intercostal space, the pulsations were

quite strong. When the patient assumed the horizontal position the tumor became less elevated, the intercostal space less in extent, and the pulsations feeble, accompanied, however, by a soft blowing sound; the pulsation was also extremely sensible to the touch in the second intercostal space, but not in the fourth. No derangement in the circulation or respiration was to be observed, except such as necessarily resulted from the pressure exerted by the aneurismal tumor upon the right lung. The obscurity of the pulsations, when sought for posteriorly, the absence of alteration in the voice and in the circulation of the jugular veins naturally suggested that the development of the aneurism was limited interiorly. In other words, that the external tumor fairly measured the extent of the aneurism.

From the consideration of the above symptoms, Prof. Ciniselli diagnosticated an aneurism of the lateral portion of the ascending aorta. It was decided to operate by Galvano-Puncture, and the operation was accordingly performed July 30, in the presence of the entire medical corps of the Hospital.

Three needles of polished steel, one millimetre in diameter, were plunged into the third intercostal space; the first at a distance of one and one-half centimetres from the sternum, the other still further from the median line and about two centimetres apart; they were all then violently shaken by the pulsations of the aneurism. The electric current was derived from a voltaic pile of 30 couples, having the dimensions of ten centimetres square and in which the exciting element was a saturated solution of sea salt. This is the apparatus with which Dr. Ciniselli has had the least number of accidents, especially those which result from phlegmonous inflammation. In order to avoid eschars, caused by the chemical action of the current, the most redoubtable accident in Galvano-Puncture, the operation was begun by applying the positive pole on one of the needles, and the negative electrode near the tumor upon the skin by means of a pledget saturated with salt water. The positive electrode was then transferred to the other needle and the negative to the needle which had already been submitted to the action of the positive pole, and so on, so that each needle had been placed

in communication with both poles. The oxidation of the needles by the action of the positive pole, and the oxygenation of the blood, which manifests itself by a dark little ring around the wound ensures sufficient insulation for a limited application of the current, a result which has been sought by layers of insulating substances (? A. M. H.) This fact has been demonstrated by many clinical experiments. The shifting of the electrodes from needle to needle, was so managed as to avoid subjecting the patient to unnecessary shocks. Experience has shown that in order to profit by the insulation of the needles, produced by their oxydation under the action of a battery of sufficient tension to cause coagulation of the blood, the application of the current should be limited to five minutes for each needle. It is also prudent, in order to avoid the danger of too great reaction, not to prolong the operation beyond half an hour.

On this occasion, however, it was suggested by one of the gentlemen present that an electric clot might become detached from the mass in the process of coagulation and be carried into the current of the general circulation, thus exposing the patient to the danger of embolism. Acting upon this consideration the operator prolonged the application upon each needle beyond the accustomed time, and even to ten minutes upon the needles nearest the sternum, with the view of bringing about a firmer adhesion between the electric clots and the walls of the aneurismal sac. This practice, while guarding against embolism, nevertheless occasioned electro-chemical cauterization at the level of the two punctures, but as they were superficial, nothing serious resulted from it. Altogether the current was applied for forty minutes. The skin covering the tumor was red and tumefied. The extraction of the needles, which was done at once, was somewhat difficult as well as painful, owing to the adhesions which, during their oxydation, they had contracted with the adjacent tissues. In spite of the precautions taken to depress firmly the skin while extracting the needles, a certain amount of blood escaped into the cellular tissue. There was no escape of gas. The arterial hemorrhage unimportant in amount, yielded promptly to the ap-

plication of a compress saturated with lead water, and a bladder filled with pounded ice. Ice water was given the patient to drink.

The burning sensation which had attended the operation ceased soon afterwards; the pulsations of the tumor returned to their ordinary state, so that the patient regained his composure.

On examining the needles and their oxygenation, it was seen that the one nearest the sternum had penetrated to the depth of a centimetre and a half into the aneurismal cavity, having traversed solid tissues two centimetres in thickness, as was proved by the great oxyiation at the point. The second needle penetrated as far as three centimetres and a half within the cavity of the aneurism, having traversed tissues only one centimetre in thickness. The third, or most external needle, penetrated to the depth of two centimetres and a half into the aneurismal sac, having traversed tissues two centimetres in thickness.

The operation was not followed by general reaction, the local reaction characterized by the swelling and redness of the skin, subsided under the continued application of ice during the first two days, and of lead water continued some days longer.

The effusion of blood into the cellular tissues, and all local reaction disappeared six days after the operation, when the tumor was found to be reduced in projection nearly to the level of the walls of the thorax. The third rib alone preserved the curve which it had acquired. Pulsation throughout was feeble and obscure, at the third intercostal space it was likewise feeble and more deeply seated than before the operation, it was also scarcely perceptible through the fourth rib.—The most encouraging indicative result of the operation, however, was the assurance on the part of the patient that all difficulty in breathing had left him, and that he could rest comfortably both upon the back and sides, preferring the right side, however.

He had regained both sleep and comfort, things which had been for two months denied him.

In spite of this satisfactory state of things, the patient was ordered to keep his bed for three weeks, *Digitalis* being exhibited to moderate the force of the circulation, while at the same time he was placed upon a strong meat diet, with the view of supplying to the blood the plastic elements necessary for the formation of a clot capable of filling the entire cavity of the aneurismal sac.

At the expiration of that time, on examining the patient in the erect posture, the tumor was perceived to be slightly more elevated, pulsation was visible and less deeply seated in the third intercostal space, the bellows sound was nearly the same as before the operation. The amelioration in the patient's condition persisting, he left the Hospital Sept. 11, 43 days after the operation.

Sept. 26—58 days. The patient having presented himself, it was noticed that the curve of the third rib was reduced nearly to the normal state; the tumor consequently disappeared, but a slight tumefaction, upon which the eye no longer distinguished pulsation remained. These last were still sensible, however, to the touch at the level of the third rib, and of the intercostal space but, more obscure. The patient continued to live comfortably, maintaining a nutritious diet: he complains only of general pains, more particularly in his limbs, doubtless the result of the arthritis, which has entirely left him.

Oct. 14, (66th day after the operation.)

The patient has gained in flesh and in strength. Examined shortly after having taken a walk of one mile; he feels neither pain nor difficulty in breathing. The pulsations are still sensible to the touch in the third intercostal space, but more deeply seated than before. The bellows sound has nearly disappeared; the vesicular murmur can be distinguished more plainly through the tumor. From all these changes we are led to suppose that the aneurismal sac is nearly filled with clots, and that the still perceptible pulsation should not so much be attributed to the movement of expansion and contraction of the aneurism as to the impulse which the tumor naturally receives from the aorta.

October 13, (74th day after the operation.

The patient feeling entirely restored, and tired of doing nothing, resumes his previous occupation.—New York Med. Journal, May, '69. P. 134.

CASE OF ANEURISM OF THE SUBCLAVIAN.

DR. SANDS, New York Hospital, March, 1869.

Peter Kieglas.

Ad. March 22.

The patient was a sailor, 19 years old. He had fallen from the foretop of the vessel and had struck upon his chin, thus causing a sudden and violent extension of the neck. This occurred eight weeks ago. Besides this, one or two lacerated wounds of the soft parts covering the inferior maxilla. No injury was discovered at the time of accident. A few days afterwards, however, the patient began to suffer from slight pain and numbness in the arm and shoulder, and in the course of a fortnight a pulsating tumor was noticed on the right side of the neck, close to the larynx, and at that time had acquired very formidable dimensions. It occupied most of the lateral triangle of the neck and extended inwards beneath the sternocleidomastoid muscle as far as the median line. Its shape was pyramidal, the apex somewhat rounded off, reaching as high as the top of the larynx, while the base extended downwards behind the clavicle and sternum. The sternal end of the clavicle was partially dislocated forwards and pulsated strongly, as did all those portions of the tumor which could be examined. The aneurismal murmur was also exceedingly well marked. The pupil of the right eye was contracted, pro-

bably from the pressure of the tumor upon the cervical portion of the great sympathetic. The tumor itself was very readily compressed, showing that its contents were fluid. The pulsations of the right carotid and brachial arteries were more feeble than those of the corresponding vessels of the opposite side, the difference, however, being only slight in the carotids. "On the outer side of the tumor the finger could be passed behind the clavicle, and by pressing in the direction of the first rib" *I was able to arrest the pulsations of the radial artery."

In regard to diagnosis, no doubt existed as to the character of the aneurism. Further examination revealed an aneurism of the first part of the subclavian.

The magnitude of the aneurism and its proximity to the great trunks, combined with the low state of the patient, precluded surgical interference by the ligature. Pressure (digital) was tried, however, by twelve students. This was commenced on the 23d of March and continued for 26 hours, but the only result was a large ulceration of a gangrenous nature, produced by the fingers of the operators. This largely covered the sac, and at one time threatened to eat through the sac wall and produce secondary hemorrhage.

On the 15th of April, with the aid of Dr. Gueieke, of this city, galvano-puncture was performed. One gilded needle insulated was attached to the positive pole, while the negative was fastened to a handle holding a steel plate covered by sponge. The elements were 20 in number, and were a modification of Bunsen.

The needle was introduced at the upper part of the sac—the negative sponge was placed at the upper part of the sternum. The current was applied 15 minutes.

The pulse stood during the operation :

	P. M.	Pulse.
Needle introduced 15 minutes	5:09,	140
	5:12,	128
	5:14,	120
	5:16,	136
	5:19,	120
	5:24,	needle removed.

*Dr. S. account before N. Y. Pathological Soc.

During the operation a slight tumefaction was noticeable, at the negative spot, the skin was vesicated. No bad effects followed. May 22; operation repeated. May 26; again—each operation lasting 15 minutes. Notwithstanding the tumor became firmer, it enlarged so rapidly, and produced so much pain, that at the patient's request galvano puncture was not repeated. On the 9th of June the patient was suddenly stricken down by the bursting of the aneurism externally; the hemorrhage recurred on the 12th and proved fatal. The rupture took place through the ulcer.

Post-mortem examination, showed that the aneurism involved the first part of the subclavian; that it was produced by the forcible tearing away of the thyroid axis. The internal jugular vein, pneumogastric nerve and carotid, are pushed with the larynx far to the left of the median line

When the sac was laid open over three pounds of coagulum were found. At the entrance of the needles, exteriorly, were two or three little charred spots, while internally large masses of white, stratified fibrinous clots were attached at these points. This clot must have occupied nearly two thirds of the sac.—
*It is impossible to avoid the conclusion that in this case galvano-puncture, though it failed to cure the disease, yet caused the deposit of stratified fibrine to an extent which, in a less formidable aneurism, might have brought about the desired result." A. H.

*Dr. Sands in report before N. Y. Path. Soc.

ANEURISM OF THE COMMON CAROTID.

J. Holmes, aet. 43.

Mar. 26, 1866.

The patient, a discharged soldier, presented himself, his constitution broken down by the ravages of syphilis and hard drink.

He had two soft nodes, one on the sternum, the other over one of the ribs. There were strumous enlargements of the lymphatic glands on the left side of the neck, communicating with the surface by two or three fistulous openings. physical examination of the chest detected bronchial trouble. Patient had diarrhoea and Bright's disease.

Progress of the disease. May 7. Patient suffered from pain in the glandular swellings on the left side of the neck; below this a deep seated tumor could be felt, containing fluid. This tumor had well marked diastolic pulsations, and was partly covered by the sterno cleido-mastoid. Pressure on the sac impeded respiration. Pressure on the carotid below it could not be borne, on account of pain and induced vomiting. There was no *bruit soufflé*. Pressure made by the aneurism on the side of the larynx produced cough, of wheezing character. Patient was in no condition for operation by the knife.

May 15. In presence of Drs. Hamilton, Mc Dowell and Mr. Stapleton, at Jarvis St. Hospital, the operation was performed. The Aneurism was about the size of a hen's egg, but rather flat, of somewhat regular shape, with a round, smooth projection on the inner side. Anteriorly the aneurism was on a level with the cricoid cartilage; the sterno-cleido mastoid was stretched over it. The pulsations were strong, but no bruits or souffles were audible.

OPERATION.

A thin gold needle was passed into the sac 'till it had penetrated an inch; another needle was passed on the inner side of the aneurism. The needles were then made to touch one another at their points in the centre. "I used gold needles as productive of more complete coagulation of the blood than steel. They were insulated by shellac up to their points.—Smee's battery of 12 cups was used. The action at first was hardly perceptible, the plates being immersed but a few inches. When the whole force was used the pain was inordinate; patient compared it to the bite of a leech. At the end of fifteen minutes the coagulation of the blood was not sufficient to

cause any marked change in the tumor; but after this the pulsations were very visibly decreased in frequency, the tumor became firmer and harder; patient had become uneasy; he felt a weighty sensation, with severe pain; he felt, as he said, as if he were held by the teeth of a dog; he had a feeling of tightness in his forehead, with some pain. The sensations of pain in the tumor and those in the forehead assumed a violent, if not an alarming character, but the most serious symptom was the great increase of the swelling as coagulation took place, chiefly from below upwards, in the course of the sterno-cleido-mastoid.

At the end of 25 minutes complete coagulation had taken place in the tumor, which felt solid, and pulsation was imperceptible.

ANEURISM OF THE EXTERNAL ILIAC.

The patient was a sergeant in the Madras Fusileers.

“It was impossible to effect good compression. On the 4th of September two long, fine needles were introduced an inch within the aneurismal sac; each connected with the wires of a galvanic battery (induction machine). The needles were of zinc and covered by a layer of lacquer. Pressure as firm as could be borne was made above, but it was not sufficient to stop pulsation. The sensible effect of this kind of electricity was pain in the groin and violent agitation of the whole body. At the end of twenty minutes the needles were withdrawn; *the tumor was still pulsating.* Strict quietude was enjoined. For three days after, neither the aneurism or general health indicated that any effect had been produced.

Sept. 8. The tumor painful; the patient is in a nervous, depressed state; he cannot sleep. This condition passed off, and on the 12th returned. Leeches applied, and sedatives administered.

Sept. 16. Much constitutional disturbance; violent inflammation about the hip. Purgatives and refrigerants indicated.

Sept. 19. Inflammation subsided; tumor larger; pulsations not so strong; Digitalis and Morphine given.

Sept. 17. Tumor harder; pulsation feeble. Oct. 6. Pulsation was very faint. Oct. 8. Scarcely to be felt. Oct. 11. No pulsation. In the last three days the tumor has been harder and diminished in size. No pulsations can be felt by the stethoscope for two inches above and below the sac. Oct. 20. No return of pulsation, the tumor is gradually decreasing in size; the limb has lost the numbness, so long felt in it, and the patient only complains of want of power to walk. The remains of the aneurism feel like an enlarged inguinal gland; the leg is slightly cedematous.

CASE OF PETREQUIN.

ANEURISM OF THE BRACHIAL ARTERY.

The patient was 29 years of age. The aneurism was at the bend of the elbow and followed a wounding of the brachial artery.

OPERATION.

Four fine steel needles, with spiral heads, were used; two were inserted externally and two on the inner side. A pile of 45 elements was used, each element being near seven centimetres apart. They were charged by a strong solution of Sal-

Ammoniac. The needles formed four angles, so that their points could be moved in the cavity of the tumor, converging toward the centre, without moving the wires from the battery, which were isolated by silk. An assistant compressed the brachial artery. Petrequin put the zinc pole in communication with the needle, upper and most external, and the copper pole with the upper internal; after three minutes of galvanic action he put the zinc pole on the lowest external needle; after three more minutes he changed the copper pole to the other lower needle; at the end of three minutes more he returned the zinc pole to the upper internal needle, for the purpose of changing the direction of the currents, without influencing their nature.

During the twelve minutes employed, the tumor became harder below, but not so hard above. This decided the operator to yet apply the current to the two upper needles. The operation was completely successful.

The succeeding operations were well borne by the patient, who suffered greatly when the needles were withdrawn.— When they were removed a vessel full of cold water was applied to the arm and a compress placed on the brachial artery, but this means of procedure was useless, for the tumor did not again pulsate. Three days after, the compression was removed. The part was ulcerated from partial destruction of vitality. Pulsation returned in the radial at length, and in the uelnar shortly afterwards. 28 days after the operation the aneurism did not exist.



A. H. Fecht, 1870.

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